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LEVERAGING ON MOBILE BUSINESS TO ENHANCE FIRM PERFORMANCE: AN ORGANIZATIONAL LEVEL STUDY

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Abstract

Advancements in mobile technologies leverage the potential of m-business to impact organizational performance. This study aims at identifying the determinants of m-business usage and its impact on the firm's performance. The Technology-Organization-Environment (TOE), Diffusion of Innovation (DOI) and Resource-Based View (RBV) theories ground this research's conceptual model for assessing the value of m-business in an organizational context.

Two different methodologies are combined in this study. The first consists on an exploratory study based on expert interviews to define m-business value and the impacts that its usage may have on the organization. The second develops a nomological net to assess m-business usage and value. The measurement and structural models are then tested using structural equation modelling as implemented in Smart PLS based on the data of 180 Portuguese organizations.

Results show that compatibility and complexity are not among the factors that are antecedents of m-business usage, while relative advantages, technology competence, technology integration, managerial obstacles, competitive pressure, low partner pressure and mobile environment are significant antecedents of m-business usage. Additionally, supporting the results from the interviews, impacts on the procurement dimension is less significant than impacts on the marketing and sales and internal operations dimensions of m-business value.

Keywords: mobile business, business value, technology-organization-environment framework, diffusion of innovation

1 Introduction

Global leaders in mobile technology and m-business are not necessarily the richest economies or the leaders on fixed line communications or Internet adoption (Dholakia et al. 2004). Portugal, for example, has a per capita income less than one third of countries such as Japan, Switzerland and the United States, and lower penetration on fixed line telephony and Internet usage, but is far ahead in terms of mobile penetration (Dholakia et al. 2004). This fact suggests that Portugal is an interesting country for the present study, leveraging on the Portuguese high mobile penetration rates and early adoption rates. The mobile broadband penetration has been growing exponentially, at the same rate as broadband, accounting for 25% of the total Portuguese population (Anacom, 2010). Portugal holds the second highest mobile broadband penetration rate (Anacom, 2010), which also reinforces the argument that Portugal possesses compelling characteristics to study m-business.

Technological advancements in mobile communications enable new ways of doing business (Raisinghani 2002) often referred to as “mobile business” or “mobile commerce”, and this has led to an increased interest in the usage of mobile business applications in organizations (Gebauer et al. 2004). In fact, mobile business may provide a great opportunity to the development of other strategic applications for businesses (Barnes 2002). Despite the large number of papers about this subject, there is presently no unified view of how this can affect or change the way companies can leverage the potential value of m-business. There is also a lack of empirical research on how to develop a successful m-business strategy (Lehmann et al. 2010). The present research aims at fulfilling the existing gaps in the literature regarding m-business value, proposing a comprehensive research model with the antecedents of m-business usage, which drives m-business value from the organizational point of view.

In order to contribute to the understanding of m-business value and its impacts in an organizational context, this research aims at developing a conceptual model to assess mobile business usage and business value for firms, which is then tested within its nomological net. To achieve this, the following research question guides this paper: *What are the determinants of m-business usage and value?*

We first reviewed the existing literature on m-business and innovation adoption. Second, we developed a conceptual model based on the Technology-Organization-Environment (TOE) (Tornatzky et al. 1990) and the Diffusion of Innovation (DOI) (Rogers 2003) theoretical models and we analysed m-business value creation from the resource based perspective (Peteraf 1993). The paper is organized as follows: Section II presents the literature review and the theoretical foundations, Section III discusses the methodology; Section IV describes the exploratory study, Section V presents the confirmatory study and Section VI discusses the findings, limitations and implications of this research.

2 Background

2.1 M-business

In this research, we adopt a broad definition of m-business to include the business transactions and related interactive business processes that may occur before and after actual transactions, utilizing handheld mobile devices and wireless communication networks to conduct those transactions (adapted from Tarasewich et al. (2002)). We claim that m-business has some unique characteristics that distinguish this innovation from previous ones (such as e-business). The several fundamental differences between m- and e-business stress the need for the development of an integrated model to analyse m-business usage and value from the organizational perspective. We systematise the unique time and location flexibility characteristics of mobile technologies in terms of (i) portability (the fact that one is able to readily carry them, enabling the other mobile technology characteristics to be different from traditional e-business), (ii) user or product identification (through the SIM card or RFID), (iii) localization (being able to identify the geographic position of the mobile user) and (iv) instant connectivity (ability to be reachable and to have access at any time and in any place).

As m-business relaxes the independent and mutual constraints of space and time for many organizational activities, it provides a superior value-for-time that e-business cannot achieve; thus, offering distinct value propositions from those provided by e-business (Wu et al. 2008). This time and space independency is often referred to as mobility, upon which m-business can create distinctive value propositions of (i) ubiquity, allowing easier real time access to information; (ii) convenience, through devices that store data and have easy and quick connection to the Internet, intranet or extranet, or other mobile devices; (iii) personalization through individual client identification and localization of both clients and products or services; and, (iv) unison, having real time access to organizational databases through mobile applications (Camponovo et al. 2003; Clarke 2001; Sharma et al. 2010; Watson et al. 2002). Thus, m-business has the potential to impact significantly the organizational activities, offering distinct value propositions by enabling users to be mobile and reachable anytime and anywhere (Coursaris et al. 2008). If organizations are able to leverage mobile technologies for process improvements, they will also likely benefit from improved productivity, lowered operational costs, increased customer satisfaction, and improved decision making (Varshney et al. 2002).

The several unique characteristics of mobile business justify the development of a theoretical model for analysing m-business usage and value at the organizational level. Previous conceptual models for assessing e-business usage and value may not be directly applicable to m-business and conclusions may have different implications, suggesting that the development of a specific theoretical framework for analysing m-business usage and value is needed.

2.2 Theoretical Foundations

Tornatzky and Fleisher (1990) and Rogers (2003) proposed two theoretical models of organizational innovativeness assessment: the TOE and the DOI, respectively. The objective of this paper is to analyse the usage and value of m-business from the organizational perspective, and thus the unit of analysis is the entire organization, which is treated as a single unit of analysis.

The DOI theory (Rogers 2003) aims at explaining how an innovation or technological idea moves from conception to adoption and implementation or use, and it also helps to predict if the new innovation will be successful. In this theory, the perceived innovation attributes and the organization characteristics determine the innovation adoption. Although the innovation characteristics are presented in the context of the innovation adoption at the individual level, Rogers (2003) argued that the characteristics of innovations could also be applied to the innovation adoption models at the organizational level. The innovation characteristics that Rogers (2003) considered in his model are: relative advantage, compatibility, complexity, triability and observability.

According to the TOE framework, there are three sets of factors that influence the adoption and implementation of a technological innovation by organizations: (i) the technological context, (ii) the organizational context and (iii) the environmental context (Tornatzky et al. 1990). The technological context refers to the characteristics of the technology being adopted (Basole 2005). This could include not only the technology that has been adopted by the firm but also other relevant ones available on the market. The organizational context is typically defined by descriptive features concerning the organization. The environmental context is “the arena in which a firm conducts its business – its industry, competitors, access to resources supplied by others, and dealings with the government” (Tornatzky et al. 1990, p. 154).

The Resource Based View theory (RBV) supports the theoretical link between m-business use and value. RBV sustains that a company creates value based on its heterogeneous resources that are (i) economically valuable (in the sense that they exploit opportunities and neutralize threats), (ii) relatively scarce, (iii) difficult to imitate, and (iv) immobile across companies and it creates performance advantages by integrating resources that work together in creating organizational capabilities (Peteraf, 1993). Although the IT infrastructure components (such as hardware, software, networks and communication) are somewhat commodities, the way they are integrated, used and aligned with the company's overall strategy is complex and not wholly understood. Organizations that embrace m-

business more broadly and deeply into their value chain activities are capable to create superior business value deriving from that usage of m-business.

3 Multi-method Research Design

A sequential research design, as suggested by Mingers (2001), was applied in the present work so that a qualitative exploratory study fed a subsequent confirmatory study. The combination of different methods in this investigation serves to strengthen its meaning, discussion and conclusions. The qualitative study objective was to validate a new concept definition (m-business value) and to assess the impacts that the usage of m-business has at the organizational level through interviews of experts. The results of this exploratory study allowed the validation of a central construct in the model and served as input to the next step of the study: the validation of the nomological net.

4 The Exploratory Study

Given the newness of the concept, and the absence of existing theoretical models of m-business value, we conducted a study to validate the m-business value definition and to explore additional insights on mobile business value that may ground further research. To define m-business impacts at the organizational level, we needed our interviews to be conducted with m-business experts. Those interviews also allowed us to assess the timely relevance of conducting this study. In prior research, executives' perceptions regarding IT business value have been used to assess the actual impact of IT in the value chain activities in a process-oriented approach (Chang et al. 2009; Tallon et al. 2000). We therefore decided to approach a number of executives in Portuguese companies where m-business is employed on a regular basis. The subjects selected for interview were experts who have participated in well-known m-business projects from five large Portuguese companies (banking, telecommunication, distribution and utility sectors). Additionally, in order to further validate the information gathered in the interviews with organizational participants, we interviewed two experts from other countries.

The data were obtained through interview questions, company documents, and secondary data from the companies' reports, financial statements, and published articles. The number of interviews was determined by saturation, a standard approach to data collection in qualitative research (Nah et al. 2005). Nine face-to-face semi-structured interviews (Myers 1997) were conducted, although the saturation point was reached after the seventh interview. Each interview lasted approximately one hour, and was conducted in Portuguese.

The transcribed data was analysed based on the techniques of content analysis proposed by (Bardin 2004) that allow for maximizing the objective and internal validity of the work. We used this approach to develop a coding template. We then analysed all the interviews according to a grid of categories taking into account the frequency of subjects taken from a set of speeches considered to be segmented and comparable. Once the template was completed and validated with other researchers, two coders coded two interviews each. After coding two interviews by both coders, we calculated the Cohen's Kappa for each transcript. One of the interviews achieved a very high Kappa of 0.80, while the other had a very low Kappa of 0.10. Meetings between the coders and discussions led us to realize that the second coder did not code some of the information in the one file because it seemed "obvious". Once the coders agreed on the procedures again, they coded a new transcript, and their coding resulted in an inter-coder reliability of 100%. One coder coded the remaining interviews.

The results provided important information on m-business value. The impacts presented in Table II resulted from the literature review and were validated in the interviews. We validated that m-business value can be defined as the impact m-business usage has on firm performance, which is measured by three major organizational value chain activities: (i) marketing and sales; (ii) procurement and (iii) internal operations. The unique key characteristics of mobile business allow organizations to improve their business processes, which may have significant impact on marketing and sales, internal operations and procurement dimensions, allowing us to put forward the following proposition: *Mobile business*

value is a second order formative construct that is composed by the following dimensions: impact of mobile business on marketing and sales dimensions, impact of m-business on internal operation dimensions and impact of mobile business on procurement dimensions. Additionally, our findings from the interview results show that the impact on procurement is not as clear as the impact that the usage of m-business has on the other two dimensions. This led us to formulate the following sub-proposition: *Mobile business has less impact on procurement dimensions than on marketing and sales and on internal operations dimensions.*

5 The Confirmatory Study

Based on factors within the three contexts proposed by the TOE framework and DOI theory: relative advantage, compatibility, complexity (Technology factors), technology competence, technology integration, managerial obstacles (Organizational factors), competitive pressure, partner pressure and mobile environment (Environmental factors), we developed a research model for analysing m-business usage (Figure 1). Consistent with the RBV theory, the use of m-business will affect the firm's value creation.

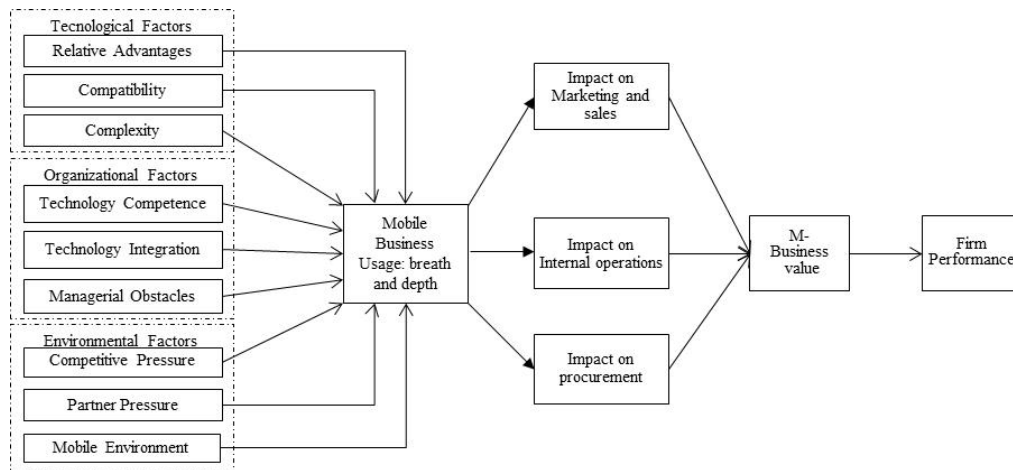


Figure 1. Research Model for M-business Usage and Value

Comparing the two theories used to guide our research about the antecedents of m-business usage, we find that DOI and TOE are similar to the extent they acknowledge the technology innovation characteristics and the organizational characteristics as being important to explain the innovation usage. However, the TOE provides a richer insight since it also comprises environmental factors. Thus, in the present research we combine features of the two models to derive an integrated research framework for m-business usage and focus on a set of variables that are the most common antecedents present on the existing IT, e-business and m-business related literature. Tornatzky & Klein (1982) suggested in their meta-analysis of innovation characteristics and innovation adoption-implementation, that relative advantage, compatibility and complexity are the most relevant constructs to characterize innovation to adoption and implementation research. Thus, we include these in our study to characterize the innovation technology. We also added mobile environment, which comprises a set of measures that are frequently mentioned in the mobile business specific literature as important to explain m-business usage. The introduction of value creation reinforces the RBV theory, as value creation derives from the usage of a technology rather than simply its adoption and penetration rate (Zhu et al. 2005). Tallon et al. (2000) have introduced a process-level model of IT business value, defined as the contribution of IT to firm performance, focusing on how IT impacts critical business activities within the firm's value system (in the context of the firm's value chain). Table I presents the antecedent constructs of the model.

Adapting the reasoning from previous e-business studies, *m-business usage* is defined as the extent to which m-business is being used to conduct business activities, measured by the breadth of use for different business activities and depth of use for each activity performed at the mobile platform (adapted

from Zhu et al. 2005). A higher depth and breadth of m-business usage increases *m-business value*, according to the RBV. Even though mobile technologies could somehow be considered a commodity as many other technologies, the specific way in which an organization “digests” this technology in its business processes and integrates it in its supply chain is unique. Higher degrees of IT usage will be associated with business performance improvement (Zhu et al. 2005). Our ultimate endogenous variable is *impact on organization performance*. Our model proposes that the second order construct m-business value, affects the overall organizational performance.

Antecedent	Definition	Example
Relative advantage	Degree to which an innovation is perceived as providing greater benefits than its alternatives (Rogers 2003).	Unique characteristics of m-business (portability, user identification, instant connectivity, localization) provide newer benefits and potential competitive advantages along the value chain (Sheng et al. 2005).
Compatibility	Degree to which an innovation is perceived of being consistent with existing practices and values (Rogers 2003).	When organizations have a high degree of process readiness, their m-business characteristics closely match these current processes. High degree of compatibility is a facilitator for m-business usage (Wang et al. 2010).
Complexity	Extent to which an innovation is perceived as relatively difficult to understand and use. It usually constitutes an inhibitor for the innovation adoption (Rogers 2003).	M-business can require the development of applications for many different devices, multi-transaction services, flexible location, flexible service and configurations, varied user experiences and enterprise integration (Tsai and Gururajan 2007). The more complex the development, the less likely the usage of m-business.
Technology competence	Organizational information technology infrastructure and its IT professionals (Zhu et al. 2006a; Zhu et al. 2006b).	As m-business requires high levels of mobile technology usage, firms’ ability to deploy and use mobile technologies in an efficient and effective way is needed for m-business value. The existence of a proper technical infrastructure and professional resources may lead to higher levels of m-business usage (Gruhn et al. 2007).
Technology integration	Capability of the organization to integrate m-business applications with the organization’s databases and systems. This is also referred to as unison, which means the ability of having a consistent view of information with data integrated across multiple applications (Watson et al. 2002).	Users of m-business need to be able to access and update data in core systems such as CRM or ERP from mobile devices, just as they would from regular devices. If not possible, than m-business is less used.
Managerial obstacles	Barriers or constraints related to the management of the organization.	Top management support is an important determinant of m-business usage (Liang et al. 2007). Lacking staff with m-business expertise is also a barrier for m-business usage.
Competitive pressure	Degree to which an organization is affected by competition in the market.	Intense competition is likely to influence m-business use (Dholakia et al. 2004). Additionally, in contexts where ICT influences competition may also lead to higher levels of m-business usage (Wang et al. 2010).
Partner pressure	Degree to which the organization’s customers or providers who have adopted an innovation pressure the organization to use it.	Prior research shows that when partners have power of the organization, they can pressure this organization to use it. This pressure has been identified as a facilitator in innovation use (Teo et al. 2003).
Mobile environment	The technological, legal, and structural characteristics of the mobile environment in which the firm operates.	Exposure to mobile technology has been found a significant determinant of m-business adoption in prior research (Khalifa and Cheng 2002).

TABLE I. CONSTRUCTS’ DEFINITION AND EXAMPLES

5.1 Data Analysis and Results

The questionnaire’s structure and design were based on the theoretical discussion of mobile business, on the findings from the exploratory study, and on the existing instruments that were adapted to fit the m-business context. The questionnaire was pre-tested with five research colleagues and three executives. A pilot study involving 111 top-level executives from the Information Systems, Operations and Marketing departments was then conducted in order to assess the reliability and validity of the constructs. Finally, we drew our sample from the Dun and Bradstreet (Portugal) database, which lists the 5000 key business

from a broad spectrum of industries operating in Portugal. We chose the 400 largest companies¹ from that list (according to amount of revenue) and the Web survey was sent by email to the directors of IS, Operations or Marketing departments. As in this study the unit of analysis is the organization, it is important to have senior informed respondents in order to collect the most accurate perspectives (Grover et al. 1993). The instrument was further validated again by assessing the measurement model for the full sample. As a result, minor changes were made. Table II presents the items used and the literature sources for each construct.

Construct/ Nature	Items	References
Relative advantages (R)	Sales increasing, cost decreasing, reduction of paperwork, quick data capture and analysis, value of brand and partnership	Adapted from Zhu et al. (2006a)
Compatibility (R)	Compatibility with: selling process, procurement process, existing distribution channels, organization culture, information infrastructure	Adapted from Zhu et al. (2006a)
Complexity (R)	Complex to use, complex to develop	Adapted from Grover (1993)
Technology competence (F)	Number of: total mobile devices, IT professionals and several IT infrastructures in use by the organization	Adapted from Zhu et. Kraemer (2005)
Technology integration (R)	Mobile applications are electronically integrated with internal data bases and IS, databases and IS are electronically integrated with those of business partners	Adapted from Zhu et. Kraemer (2006a)
Managerial obstacles (R)	Integrating the mobile platform into overall strategy and business process, Lacking staff with m-business expertise, Insufficient top-management support	Adapted from Zhu et. Kraemer (2005) and Pan and Jang (2008)
Competitive pressure (R)	Experienced competitive pressure to implement m-business, would have experienced a competitive disadvantage if m-business had not been adopted, degree to which the ICT influences the competition	Adapted from Zhu et. Kraemer (2005) and Wang et al. (2010)
Partner pressure (F)	Customers demand it, coordination between suppliers and customers, suppliers require it	Adapted from Hsu et al. (2006)
Mobile environment (F)	Availability of bandwidth and spectrum on mobile networks, adequate mobile client devices, security of data, cellular standards adopted by the country, availability of attractive software packages, cost-efficient mobile platform available in the market	Adapted from Barnes et al. (2006), Dholakia et al. (2004) and Tarasewich et al. (2002)
M-business usage (R)	Number of m-business functionalities in use, support employees to work independently of corporate office and immediately when necessary, extent of: internal process, consumer sales, business sales, procurement and customer services conducted mobile	Adapted from Zhu et. Kraemer (2005)
Impact on marketing and sales (F)	Sales increased, improved product and service innovation, customer satisfaction increased, increase convenience/ service level to customers, facilitate communication with customers	Results from the exploratory Study
Impact on internal operations (F)	Internal operations more efficient, facilitate communication among employees, increased control, improved decision making, reduce administration workload, increase profitability, improved, better information quality	Results from the exploratory Study
Impact on procurement (F)	Inventory costs decreased, coordination with suppliers improved, facilitate inventory management,	Results from the exploratory Study
M-business value (F)	Second order formative constructs comprised by impact on marketing and sales, on internal operations and on procurement	Results from the exploratory Study
Firm performance (R)	Success, overall business performance, costs vs. benefits, effect	Gattiker et al. (2005)

(R) – Construct modeled as Reflective; (F) – Construct modeled as Formative

TABLE II. OPERATIONALIZATION OF CONSTRUCTS

We received a total of 150 responses, which corresponds to 133 organizations and to response rates of approximately 15% individually and 40% at the organizational level, which is a good response rate for this type of research. In order to increase our sample size, we used 71 responses from the pilot test from respondents with a director or above job function. Given that these additional observations could be different from the ones received in the final survey, we used the Mann-Whitney U-test to compare the median for the pilot test group and the final survey group. For almost all variables the distributions are

¹ We measured the effect of company size (number of employees) on m-business usage and it was not found to be significant.

equal between groups and the median or average are also equal between groups. Therefore, we included those additional responses in our final data set of 221. After deleting 15 observations for duplicate organization response and 26 observations for large amount of missing data (which represents 17% of the total responses), we had 180 usable responses. In the final dataset, three types of industries are represented (services 52%, manufacturing 25%, and distribution 13.9%). The majority (92.2%) of respondents are directors, which are high-level job positions within the organization, enhancing the quality of the data source. Potential bias from IS vs. non-IS respondent and from non-respondents were analysed using the Mann-Whitney U-test. In both cases, there were no differences of medians between the different groups of respondents. Therefore, we concluded that those biases are not a concern in our dataset. Common method bias is another possible problem with research that uses self-reported data (Liang et al. 2007a). This potential bias was assessed by the Harmon one-factor test (Podsakoff et al. 1986). Results show that twelve factors are present and that the most covariance explained by one factor is approximately 31%, indicating that common method bias is not a likely contaminant of results.

As we are interested in the effects of the TOE and DOI variables in the organizational m-business usage and value, an organizational-level model was developed and tested. In this study, Smart PLS 2.0 (Ringle et al. 2005) was used to evaluate the measurement and structural models. PLS was chosen because the research model has both formative and reflexive constructs, and is complex with some constructs presenting mixed scales.

5.1.1 Evaluating the Measurement Model

For the measurement model assessment, different analyses were performed according to the nature of the construct (i.e., whether it was modelled as reflective or as formative). Table II depicts the nature of each construct. Following the guidelines proposed by Henseler et al. (2009), the reflective measurement model assessment was performed for internal consistency, indicator reliability, convergent validity, and discriminant validity.

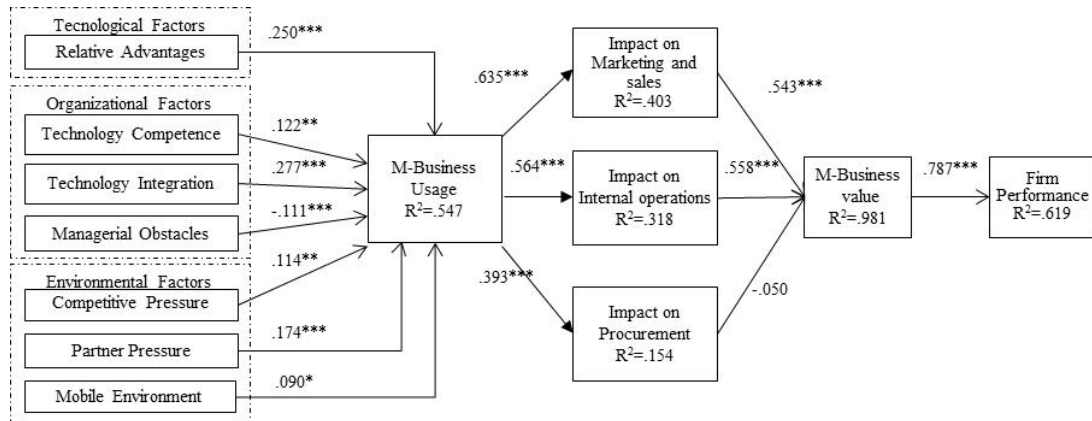
The internal consistency was evaluated by Cronbach's alpha and the composite reliability. All latent variables show good performance in terms of internal consistency as the values for the Cronbach's alpha are between 0.66 and 0.95 and for the composite reliability between 0.80 and 0.97, which should be above the 0.7 cut-off value (Henseler et al., 2009). Although two indicators have values smaller than 0.7, they are higher than 0.4, the minimum value below which an indicator should be eliminated from the model. Overall, the instrument presents good indicator reliability. The convergent validity criterion states that the AVE values should be greater than 0.5. All constructs present AVE values above 0.5 (between 0.57 and 0.94), indicating that the constructs represent one dimension and the same underlying construct, and also that the latent variable is able to explain more than a half of the variance of its indicators (Henseler et al., 2009). The discriminant validity was performed with two criteria: the Fornell-Larcker (1981) and the cross loadings analysis (AVEs should be greater than the squared correlations and each indicator should have a higher correlation to the assigned latent variable than to any other latent variable). Both criteria are satisfied for all constructs and indicators, indicating discriminant validity.

For the formative measurement model evaluation, the multicollinearity and the significance and sign of weights were assessed. For the formative measurement model, Smart PLS calculates the formative latent variables by means of multiple linear regressions (Henseler et al., 2009). Thus, multicollinearity might be a concern. The VIF (Variance Inflated Factor) is a criterion for assessing the existence of multicollinearity. For each indicator, the VIF is below the cut-off value of 3.3 (the highest is 2.9). Therefore, our measurement model does not show evidence of harmful collinearity.

5.1.2 Evaluating the Structural Model

After assessing that our measurement model holds good psychometric proprieties, Smart PLS 2.0 was also used to assess the structural model. In order to assess the structural model (the inner model), several criteria were taken into account: the R^2 of the endogenous latent variables and the estimates of path

coefficients. According to Chin (1998), the final model can be presented with only the significant paths. The significant results are reported in Figure 2.



* Significant at $p < 0.1$, ** Significant at $p < 0.05$, *** Significant at $p < 0.01$

Figure 2. PLS results (n=180)

6 Discussion and Conclusions

This research is the first integrative model and systematic test of a conceptual framework that draws broadly on the combination of TOE and DOI theories to explain m-business usage, on the RBV theory to support the linkage between m-business usage and value, and on the process oriented theories of IT business value to define m-business value creation. In fact, having all factors from these theories in the same model makes it possible to investigate the relative importance of each factor to m-business usage and value.

Our first finding is that within the TOE and DOI frameworks, relative advantage, technology competence, technology integration, low managerial obstacles, competitive pressure, partner pressure and mobile environment are found to be significant antecedents of m-business usage. Among these, technology integration and relative advantages appear to be the most relevant factors. The combination between TOE and DOI theories enabled the development of a set of antecedents that are able to explain a substantial amount of m-business usage ($R^2 = 0.547$) suggesting that substantive data variation of m-business usage is explained by the exogenous variables (Chin, 1998). Figure 2 shows that organizations with higher levels of technology integration tend to achieve greater extent of m-business usage, as do organizations with higher levels of technology competence. This finding is consistent with Zhu et al. (2006b). They argue that developed countries (as it is the case of Portugal) tend to be more advanced in terms of the use of technologies and since common technologies become strategic necessities, organizations must make more profound usage of them in order to achieve competitive advantages. This is an important managerial implication, since companies able to achieve greater integration between m-business systems and partners' databases may also achieve greater level of m-business usage. Technology competence is another factor that has positive and significant influence on m-business usage among the organizational context. This finding is consistent with previous works of (Hsu et al. 2006; Soares-Aguiar et al. 2008; Zhu et al. 2005; Zhu et al. 2006b). Organizations that have already adopted technologies such as extranet, intranet, VoIP, WLAN, etc. and have more IT resources (not just equipment but also human resources), have the necessary basic technology infrastructure upon which they can build on more advanced technologies. This highlights the importance of fostering organizations' technology competence in terms of people, systems, and networks to achieve greater level of m-business usage. Managerial Obstacles is another significant factor among the organizational context although it has a negative effect on m-business usage. While the Wang et al.'s (2010) study was not able to confirm that managerial obstacles have a negative effect on RFID adoption, Zhu et al. (2006b) found that managerial obstacles have a negative effect on the three stages of e-business assimilation: e-business initiation, adoption and routinization. It is not surprising that the difficulty in integrating the mobile platform into the overall strategy and business process, lacking staff with m-

business expertise or insufficient top-management support are significant inhibitors of m-business usage. Managers can therefore be aware that those barriers can have a negative effect on the level of m-business usage within the organization. Relative advantage is the second strongest factor among all factors with effects on m-business usage and the strongest one among the technological context ones. This finding is consistent with Zhu et al. (2006a) but inconsistent with Wang et al. (2010) who were unable to conclude that relative advantages are a significant discriminator of RFID adoption. One possible explanation for this is suggested by Zhu et al. (2006a), as relative advantages play a more significant role in driving e-business usage in high ICT-intensity countries, as they are more informed in implementing IT and may achieve greater returns from IT investments. Thus, managers should understand the m-business relative advantages when comparing to other technology options which may be more relevant when resistance to change is present, so managers may highlight m-business relative advantages in order to increase acceptance.

Within the technological context, our study reveals that compatibility is not a significant antecedent of m-business usage. This finding is not consistent with Wang et al. (2010) and with Zhu et al. (2006a). In fact, if m-business is perceived as being compatible with a firm's existing procurement and distribution processes as well as with the organization culture, information infrastructure and existing information systems' experience, then it is likely that the organization has a positive impression of m-business and this facilitates m-business adoption and usage. Interestingly, apart from the fact that complexity wasn't found to be significant, it has a positive impact in m-business usage, which is contrary to what could be expected. Nevertheless, this does not mean that m-business is not a complex technology. Instead, it is the opposite: as organizations that participated in this study have already implemented at least one m-business application, they may be now more familiar with this technology thus underestimating its complexity since this innovation is already known by the organization.

Within the environmental context, all factors (competitive pressure, partner pressure and mobile environment) are significant m-business usage facilitators. Among the environmental context factors, partner pressure is the strongest in influencing m-business usage. Not surprisingly, organizations are most aware about their business partners' needs pushing or pulling organizations to engage more and more in m-business initiatives. Many of them recognized that if business partners also use certain innovations, the added value of also using it would increase. Therefore, organizations that experience more competitive or partner pressure, are more technologically advanced and perceive more strongly the appeal of mobile environment, so they are found to achieve greater extent of m-business usage.

The linkage between M-Business Usage and the Impacts on Marketing and Sales (downstream dimension), Internal Operations (internal dimension) and Procurement (upstream dimension) is found to be positive and significant. As the RBV theory states, we expected organizations that have a more extensive usage of m-business to be able to achieve a greater extent of impact on marketing and sales, on internal operations and on procurement. The results suggest that higher degrees of m-business usage are associated with improved impacts on each value-chain dimension, and the impact on marketing and sales is the highest one among the three impact dimensions. For managers, it is valuable to realize that greater levels of m-business usage have impact on the three dimensions of the value chain activities.

M-business value was found to be a second order construct composed by the Impact on Marketing and Sales and the Impact on Internal Operations. The Impact on Procurement was not found to be significant. Preliminary evidence for the validity of the conceptual model was obtained through interview data from experts in m-business, showing that m-business may have greater impacts on sales and marketing dimension and on internal operation dimension, than in procurement. This is reinforced by a study carried out by Barnes and Scornavacca (2006) which shows that, at the strategic level, the benefits of mobile and wireless applications for the organization are more on employee integration and individual performance improvement than in product, service or organizational improvement. These results lead us to conclude that the Impact on Marketing and Sales and the Impact on Internal Operations are the formative sub-constructs of the second order variable M-business Value. Interestingly, the Impact on Procurement is not present. These findings are new and different from those works that were carried on e-business (for example, (Zhu et al. 2005)) as m-business seems to have less

impact on procurement dimensions that on the other two dimensions, and the sub-proposition put forward in the exploratory study is fully supported.

Finally, m-business value has a positive and significant effect on the overall business impact of m-business on the organization. Our model also shows that m-business value explains a very high amount of the variance of the overall business performance ($R^2=0.619$). This finding is a step forward on previous models of IT usage and post usage evaluation such as Zhu et al. (2005) since those models did not comprise the overall impact of e-business on organizational performance. The positive and significant effect of m-business value on the organization's overall performance reinforces the theory that higher levels of m-business value are associated with improved business performance in terms of the perceived success of an m-business project and overall firm performance.

The approach used in this work relies on the combination of a qualitative study based on expert interviews and data collected through a web-survey. The present research also verified the integrative conceptual model proposed in Figure 1 through a survey of managers or executives able to speak about overall IT activities in the organization. This research innovates by focusing on m-business usage and going beyond the binary choice adopted/ not adopted to look into the extent of usage of m-business in terms of depth and breath, and also its impacts at the organizational level. As m-business becomes more mature and widely adopted by organizations to support and leverage their business processes, we will be able to identify new and different ways in which m-business can improve the organizational performance. Other issues that could be relevant to further investigate are the cultural dimension and the industry effects on m-business value and usage. There are also limitations to this study that should be noted. One important limitation is the fact that the impacts are subjective measures based on a Likert scale to assess the executive's perceptions about the mobile business impacts in the organization, which is not an objective variable. Despite the limitations of the study regarding the sample characteristics and country specific context, its results provide several theoretical and practical contributions. The research identifies components for the m-business value construct that could be used in future studies. Along with the other practical implications already discussed, managers can use the list of potential impacts that m-business usage may have in their organization to compare where their organization stands within its industry and also to internally evaluate m-business usage. We also propose an integrative framework that could also be used by managers to evaluate m-business usage and impacts in their organizations.

Acknowledgments

This research was partially supported by the national funds of FCT – the Portuguese Science and Technology Foundation within the strategic project PEst-OE/EGE/UI4027/2011.

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